

CLAIMS

1. A dielectric-layer-provided copper foil for forming a capacitor layer, on whose one side, a dielectric layer is formed, characterized in that:

said dielectric layer is an inorganic-oxide sputter film formed on one side of a copper foil in accordance with a sputtering vapor deposition method and having a thickness of 1.0 μm or less and a pit-like defective portion formed on the inorganic-oxide sputter film is sealed by polyimide resin.

2. The dielectric-layer-provided copper foil for forming a capacitor layer according to claim 1, characterized in that:

an inorganic-oxide sputter film is formed by using any one of or two or more of aluminum oxide, tantalum oxide, and barium titanate.

3. The dielectric-layer-provided copper foil for forming a capacitor layer according to claim 1 or claim 2, characterized in that:

polyimide resin contains dielectric filler.

4. The dielectric-layer-provided copper foil for forming a capacitor layer according to claim 1, characterized in that:

a binder metal layer is formed between a copper foil layer and a dielectric layer.

5. The dielectric-layer-provided copper foil for forming a capacitor layer according to claim 4, characterized in that:

a binder metal layer is formed by any one selected from cobalt, chromium, nickel, nickel-chromium alloy, zirconium, palladium, molybdenum, tungsten, titanium, aluminum, platinum, and alloy of these metals.

6. The dielectric-layer-provided copper foil for forming a capacitor layer according to claims 1, characterized in that:

a high-melting-point metal layer is formed between a copper foil layer and a dielectric layer.

7. The dielectric-layer-provided copper foil for forming a capacitor layer according to claim 6, characterized in that:

a high-melting-point metal layer is formed by any one selected from nickel, chromium, molybdenum, platinum, titanium, tungsten, and alloy of these metals.

8. The dielectric-layer-provided copper foil for forming a capacitor layer according to claim 1, characterized in that:

a high-melting-point metal layer and a binder metal layer are formed between a copper foil layer and a dielectric layer.

9. A copper clad laminate for forming a capacitor layer, using the copper foil layer of the dielectric-layer-provided copper foil of claim 1 as a lower electrode forming layer, characterized in that:

an upper electrode forming layer is formed on the dielectric layer and a three-layer configuration formed by three layers consisting essentially of a lower electrode forming layer, a dielectric layer, and an upper electrode forming layer is used.

10. The copper clad laminate for forming a capacitor layer, using the copper foil layer of the dielectric-layer-provided copper foil of claim 1 as a lower electrode forming layer, characterized in that:

a binder metal layer and an upper electrode forming layer are formed on the dielectric layer and a four-layer configuration formed by four layers as a lower electrode forming layer, a dielectric layer, a binder metal layer, and an upper electrode forming layer is used.

11. A copper clad laminate for forming a capacitor layer, using the copper foil layer of the dielectric-layer-provided copper foil of claim 1 as a lower electrode forming layer, characterized in that:

a high-melting-point metal layer and an upper electrode forming layer are formed on the dielectric layer and a four-layer configuration is used which is formed by four layers consisting essentially of a lower electrode forming layer, a dielectric layer, a high-melting-point metal layer, and an upper electrode forming layer.

12. A copper clad laminate for forming a capacitor layer, using the copper foil layer of the dielectric-layer-provided copper foil of claim 1 as a lower electrode forming layer, characterized in that:

a high-melting-point metal layer, a binder metal layer, and an upper electrode forming layer are formed on the dielectric layer and a five-layer configuration is used which is formed by five layers consisting essentially of a lower electrode forming layer, a dielectric layer, a binder metal layer, a high-melting-point metal layer, and an upper electrode forming layer.

13. A copper clad laminate for forming a capacitor layer, using the copper foil layer of the dielectric-layer-provided copper foil of claim 4 or 5 as a lower electrode forming layer, characterized in that:

an upper electrode forming layer is formed on the dielectric layer and a four-layer configuration is used which is formed by four layers consisting

essentially of a lower electrode forming layer, a binder metal layer, a dielectric layer, and an upper electrode forming layer.

14. A copper clad laminate for forming a capacitor layer, using the copper foil layer of the dielectric-layer-provided copper foil of claim 4 or 5 as a lower electrode forming layer, characterized in that:

a binder metal layer and an upper electrode forming layer are formed on the dielectric layer and a five-layer configuration is used which is formed by five layers consisting essentially of a lower electrode forming layer, a binder metal layer, a dielectric layer, a binder metal layer, and an upper electrode forming layer.

15. A copper clad laminate for forming a capacitor layer, using the copper foil layer of the dielectric-layer-provided copper foil of claim 4 or 5 as a lower electrode forming layer, characterized in that:

a high-melting-point metal layer and an upper electrode forming layer are formed on the dielectric layer and a five-layer configuration is used which is formed by five layers consisting essentially of a lower electrode forming layer, a binder metal layer, a dielectric layer, a high-melting-point metal layer, and an upper electrode forming layer.

16. A copper clad laminate for forming a capacitor layer, using the copper foil layer of the dielectric-layer-provided copper foil of claim 4 or 5 as a lower electrode forming layer, characterized in that:

a high-melting-point metal layer, a binder metal layer, and an upper electrode forming layer are formed on the dielectric layer and a six-layer configuration is used which is formed by six layers consisting essentially of a lower electrode forming layer, a binder metal layer, a dielectric layer, a binder

metal layer, a high-melting-point metal layer, and an upper electrode forming layer.

17. A copper clad laminate for forming a capacitor layer, using the copper foil layer of the dielectric-layer-provided copper foil of claim 6 or 7 as a lower electrode forming layer, characterized in that:

an upper electrode forming layer is formed on the dielectric layer and a four-layer configuration is used which is formed by four layers consisting essentially of a lower electrode forming layer, a high-melting-point metal layer, a dielectric layer, and an upper electrode forming layer.

18. A copper clad laminate for forming a capacitor layer, using the copper foil layer of the dielectric-layer-provided copper foil of claim 6 or 7 as a lower electrode forming layer, characterized in that:

a binder metal layer and an upper electrode forming layer are formed on the dielectric layer and a five-layer configuration is used which is formed by five layers consisting essentially of a lower electrode forming layer, a high-melting-point metal layer, a dielectric layer, a binder metal layer, and an upper electrode forming layer.

19. A copper clad laminate for forming a capacitor layer, using the copper foil layer of the dielectric-layer-provided copper foil of claim 6 or 7 as a lower electrode forming layer, characterized in that

a high-melting-point metal layer and an upper electrode forming layer are formed on the dielectric layer and a five-layer configuration is used which is formed by five layers consisting essentially of a lower electrode forming layer, a high-melting-point metal layer, a dielectric layer, a high-melting-point metal layer, and an upper electrode forming layer.

20. A copper clad laminate for forming a capacitor layer, using the copper foil layer of the dielectric-layer-provided copper foil of claim 6 or 7 as a lower electrode forming layer, characterized in that:

a high-melting-point metal layer, a binder metal layer, and an upper electrode forming layer are formed on the dielectric layer and a six-layer configuration is used which is formed by six layers consisting essentially of a lower electrode forming layer, a high-melting-point metal layer, a dielectric layer, a binder metal layer, a high-melting-point metal layer, and an upper electrode forming layer.

21. A copper clad laminate for forming a capacitor layer, using the copper foil layer of the dielectric-layer-provided copper foil of claim 8 as a lower electrode forming layer, characterized in that:

an upper electrode forming layer is formed on the dielectric layer and a five-layer configuration is used which is formed by five layers consisting essentially of a lower electrode forming layer, a high-melting-point metal layer, a binder metal layer, a dielectric layer, and an upper electrode forming layer.

22. A copper clad laminate for forming a capacitor layer, using the copper foil layer of the dielectric-layer-provided copper foil of claim 8 as a lower electrode forming layer, characterized in that:

a binder metal layer and an upper electrode forming layer are formed on the dielectric layer and a six-layer configuration is used which is formed by six layers consisting essentially of a lower electrode forming layer, a high-melting-point metal layer, a binder metal layer, a dielectric layer, a binder metal layer, and an upper electrode forming layer.

23. A copper clad laminate for forming a capacitor layer, using the copper foil layer of the dielectric-layer-provided copper foil of claim 8 as a lower electrode forming layer, characterized in that:

a high-melting-point metal layer and an upper electrode forming layer are formed on the dielectric layer and a six-layer configuration is used which is formed by six layers consisting essentially of a lower electrode forming layer, a high-melting-point metal layer, a binder metal layer, a dielectric layer, a high-melting-point metal layer, and an upper electrode forming layer.

24. A copper clad laminate for forming a capacitor layer, using the copper foil layer of the dielectric-layer-provided copper foil of claim 8 as a lower electrode forming layer, characterized in that:

a high-melting-point metal layer, a binder metal layer, and an upper electrode forming layer are formed on the dielectric layer and a seven-layer configuration is used which is formed by seven layers consisting essentially of a lower electrode forming layer, a high-melting-point metal layer, a binder metal layer, a dielectric layer, a binder metal layer, a high-melting-point metal layer, and an upper electrode forming layer.

25. A copper clad laminate for forming a capacitor layer using the dielectric-layer-provided copper foil of claim 9, characterized in that:

an upper electrode forming layer uses any one of copper, aluminum, silver, and gold.

26. A method for manufacturing the dielectric-layer-provided copper foil for forming a capacitor layer of claim 1, characterized in that:

an inorganic-oxide sputter film having a thickness of 1.0 μm or less is formed on one side of the copper foil by using the sputtering vapor deposition method, and

a pit-like defective portion generated on the inorganic-oxide sputter film is embedded and sealed with polyimide resin by the polyimide-resin electrodeposition method.

27. A method for manufacturing a dielectric-layer-provided copper foil for forming a capacitor layer of claim 4 or 5, characterized in that:

a binder metal layer is formed on the one side of a copper foil, an inorganic-oxide sputter film having a thickness of 1.0 μm or less is formed on the binder metal layer by using the sputtering vapor deposition method, and

a pit-like defective portion generated on the inorganic-oxide sputter film is embedded and sealed with polyimide resin by using the polyimide-resin electrodeposition method.

28. The method for manufacturing a dielectric-layer-provided copper foil for forming a capacitor layer according to claim 6 or 7, characterized in that:

a high-melting-point metal layer is formed on the one side of a copper foil and an inorganic-oxide sputter film having a thickness of 1.0 μm or less is formed on the high-melting-point metal layer by using the sputtering vapor deposition method, and

a pit-like defective portion generated on the inorganic-oxide sputter film is embedded and sealed with polyimide resin by using the polyimide-resin electrodeposition method.

29. The method for manufacturing the dielectric-layer-provided copper foil for forming a capacitor layer according to claim 8, characterized in that:

a high-melting-point metal layer is formed on the one side of a copper foil and a binder metal layer is formed on the high-melting-point metal layer, and an inorganic-oxide sputter film having a thickness of 1.0 μm or less is formed on the binder metal layer by using the sputtering vapor deposition method, and

a pit-like defective portion generated on the inorganic-oxide sputter film is embedded and sealed with polyimide resin by using the polyimide electrodeposition method.

30. A method for manufacturing a dielectric-layer-provided copper foil for forming a capacitor layer according to claim 27, characterized in that:

the polyimide-resin electrodeposition method uses a dielectric-filler containing polyimide electrodeposited solution containing dielectric fillers in a polyimide electrodeposited solution, and

dielectric powder having a substantially-spherical perovskite structure in which an average particle diameter D_{IA} ranges between 0.05 and 1.0 μm , an accumulated particle diameter D_{50} according to the laser-diffraction-scattering particle-size-distribution measuring method ranges between 0.1 and 2.0 μm , and the value of coherence degree shown as D_{50}/D_{IA} by using the accumulated particle diameter D_{50} and the average particle diameter D_{IA} obtained from an image analysis is 4.5 or less is used for the dielectric fillers.

31. The method for manufacturing a dielectric-layer-provided copper foil for forming a capacitor layer according to claim 30, characterized in that:

the content of dielectric fillers in a dielectric-filler-containing polyimide electrodeposited solution ranges between 75 and 90 wt%.